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Casson Fluid Convective Flow in an Accelerated Microchannel with Thermal Radiation using the Caputo

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Abstract:
The effect of the Caputo fractional derivative in unsteady boundary layer Casson fluid flow in an accelerated microchannel is investigated. In the presence of thermal radiation, the partial differential equations that governed the problem are studied. Using appropriate dimensionless variables, fractional partial differential equations are translated into dimensionless governing equations. The equations are then transformed into linear ordinary differential equations and solved analytically using the Laplace transform technique. These modified equations are then solved using the proper method, and the result is obtained in the form of velocity and temperature profiles using the Zakian's explicit formula approach. The influence of essential physical parameters on velocity and temperature profiles is investigated using graphical diagrams created with Mathcad software. It is found that the velocity and temperature profile increase as fractional parameter, and thermal radiation parameter increase. As Prandtl number increase, both profiles are decreasing. This result is crucial for understanding the fractional system of Casson fluid in microchannel.